Invention Patent Description Report of "**DEVICE FOR THE INSTALLATION OF SIGNALIZATION SPHERES ON LIGHTNING ROD CABLES OF TRANSMISSION LINES, AND METHOD FOR THE INSTALLATION OF SIGNALIZATION SPHERES ON LIGHTNING ROD CABLES OF TRANSMISSION LINES BY USING SAID DEVICE.**"

FIELD OF INVENTION

The present invention relates to an unmanned mobile device which, by means of remote control, makes it possible to install signalization spheres on transmission lines' lightning rod cables, with the line connected, the sweeping of the cable mentioned for maintenance purposes, as well as a method for installation of signalization spheres on transmission lines' lightning rod cables using the device mentioned.

STATE OF THE ART

The method for the transportation of large blocks of electric power through long distances is done by means of transmission lines that extend to several kilometers within countries. Those power lines are lifted by towers that support themselves by means of spands, crossing rivers, railroads, roadways, or other transmission lines, and that may reach heights considerably elevated above the ground.

Due to these and other factors that affect the visibility of transmission lines, those lines represent a hazard situation for aircrafts.

In order to reduce the danger involved, the so-called line signals have been developed which, due to their size and color, provide signalization to aircraft operators, alerting them about the presence of rivers, railroads, or

other transmission lines. In a recent past, line signals have been installed at strategic distances, along transmission line spans that extend between support towers, so that those elements can become more visible to aircraft operators flying nearby.

Although there are a significant number of accidents involving aircraft bumping with transmission lines, spherical signals have seldom been used so far, not only due to the high cost involving their installation in existing lines, but mainly because of the difficulty regarding their installation itself. The difficulty and cost of installation result from the inaccessibility to the installations, the high voltage that they can transmit and the existing and available line signals themselves, which, for the purposes of a faultless installation, require disconnection of the current flow along the lines, and removal of the lightning rods of the towers or sending manpower and equipment to the towers and lines, so that it will be possible to provide the installation of the line signals. That is a time-consuming procedure, as well as difficult, costly, and most dangerous, and considering the reasons mentioned above, regarded as prohibitive in several locations.

As it is the knowledge of technicians on the subject, disconnecting high tension lines to install signalization spheres is becoming more difficult every day due to power shortage, as most circuits operate within their limits and a unscheduled disconnection could cause a general overload in all circuits, which could induce to a blackout of national proportions.

In the light of the problems presented, new alternative techniques have been developed in order to make it possible the operation with the circuits connected, works with live lines, avoiding thus large power blocks breaks for consumers.

Basically, three techniques are known so far for the installation of signalization spheres in transmission lines, those are, the use of the sliding chair on the lightning rod cable technique, the lowering of lightning rod cables until reaching the phases technique and the helicopters technique.

After several fatal accidents, all power companies are abrogating the use of the sliding chair technique or any other technique for which the electrician must walk along the lightning rod cable, once the cable sometimes would break during the walk, as line electricians had no conditions to accurately assess lightning rod cable conditions.

Nowadays, although the lightning rod cables lowering until reaching the phases and the helicopter techniques are being used, the use of signalization sphere installation by means of helicopters, even if that depends on perfect weather and wind conditions, is becoming the best option. Even though both costs are relatively high, the cable lowering technique bears an additional disadvantage, that is, the necessary disconnection of circuits.

There is thus the need to provide the installation of signalization spheres, unmanned, movable that, by means of remote control, will make it possible the installation of signalization spheres on transmission line lightning rod cables, as well as the sweeping of the same for maintenance purposes, with the line connected, of a signalization sphere for transmission lines lightning rod cables that will adapt to the operation of the mentioned device, as well as a method for the installation of signalization spheres on transmission lines lightning rod cables using the aforementioned device.

ABSTRACT OF THE INVENTION

With a view to solving the problems previously listed, in accordance with the first concretization of the present invention, an unmanned device, movable and activated by radio control is provided; developed for the installation of signalization spheres and the checking of lightning rod cable conditions, including a structure of support which consists of two equidistant and parallel bases, connected by axial segments that serve as supports for the activation engines, respectively, a grounding and traction system made of a structure composed of two parallel rods connected by axial segments, showing on their lower end slots for the introduction of a wheel shaft, called first axial segment, having in its middle section a threaded rod connected on its lower end to the axial segment of the bases mentioned above, presenting an upper handle and a spring, a movable fork on the external part of the bases on which projects the feeding movable fork descending and balanced, an ascending vertical structure inverted U-shaped, connected externally to a tilted structure to the front part of the bases, having two bars for receiving by fixation of a tightening and loosening tool and showing on their final section a coupling prism with a square hollow inside.

The present invention still uses a sphere projected to be installed by helicopters with the purpose to be driven (pushed) to the location of installation and fitted by an unmanned, movable device activated by remote control, including two semi-spheres, one vertical shaft furnished with a tightening eyelet on its upper end connected on the lower part to one of the semi-sphere support which when connected by a walrus-type connector form a conduit for purposes of lightning bolt system fitting.

Moreover, according to a second concretization of the present invention, a sphere installation method on energized transmission lines is provided, which means that it is not necessary the disconnection of the mentioned lines. This method does not use a helicopter-type vehicle, reducing significantly the costs if compared to the methods used nowadays, once no freighting or rent of a super or large-sized equipment is necessary for the performance of that installation, regardless of wind conditions, nor does it causes any losses to power companies, which would be generated by the break of energy supply. The method, according to the second concretization of the present invention, comprises the following stages:

- Fitting of signalization sphere through the side span existing between the two semi-spheres on the lightning rod cable, until the lightning rod cable is inside and not fastened to the walrus-type connector, so that the signalization sphere will be ready to be moved without the risk of falling along the lightning rod cable.
- Fitting of the device upstream from the signalization sphere, laying the device on the lightning rod cable that will be in contact with the two activating engines of the installation device, fitting the wheel in the slot through the shaft notch, so that the device grounding can be made, once the wheel is made of metallic conductive material and all the other components of the device are insulated.
- Fitting of the fork on the external part of the bases by means of a pivot, furnished with the feeding system;
- Coupling of the vertical shaft eyelet end of the sphere inside the device coupling prism and the fixing of safety cupping-glass.
- Activating the device by means of a remote control transmitter activated by activating forward/backward engines, taking it to the appropriate location of the sphere;
- Rotating wrench-wise, by means of remote control, in the objective location of the installation of the tightening and loosening tool. The

tightening will operate on the vertical shaft end of the sphere providing the closing of the walrus-type connector on the lightening rod cable.

BRIEF DESCRIPTION OF DRAWINGS

These objectives, features and advantages of the present invention, will become more distinct if examined with the detailed description that follows, when they will be considered as a whole with the drawings that are attached to this report.

FIGURE 1 represents a perspective view of the device and sphere, during an installation operation of the lightning rod cable signal.

FIGURE 2 represents a lateral view of the device.

FIGURE 3 represents a front view of the device already assembled on the lightening rod cable, where we can distinctly notice the coupling prism of the shaft.

DETAILED DESCRIPTION OF THE INVENTION

As we can gather from the Figures where equal number references identify correspondent parts, the installation device and the checking of the lightning rod cable conditions, in accordance with a first concretization of the present invention, generally indicated by numeric reference 10, comprises a structure of support 12 which consists of two equidistant and parallel bases between themselves, 14 and 16, connected by axial segments 18, 20, 22 and 24, axial segments 20 and 24 serving as supports for activating engines 26 and 28, respectively, a grounding and traction system comprised of a structured 30 formed by two parallel rods 32 and 34 which move vertically and are connected to two equidistant and parallel bases between themselves, 14 and 16, in their middle section through shaft 22, on their upper end through shaft 36 and showing on its lower end slots 38 for

the introduction of a shaft 40 of a wheel 42, aforesaid first axial segment 22 being furnished in its middle section with a threaded rod 44 which is connected on its lower end to the aforesaid axial segment 22 of the bases 14, 16, furnished on the upper side of a crank 48 and spring 50, a fork 52 articulated on pivot 46 on the external part of the aforesaid bases 14, 16, on which is projected the feeding system 54, a tilted structure 60 consisting of two equidistant bases 62 and 64 connected by four axial segments 66, 68, 70 and 72, the latter serving as support to the tightening and loosening tool 74, shows in its terminal portion a coupling prism 56 and still hoisted internally and externally by bars 76, 78, 80, 82, respectively, equidistant by axial segments 70 and 68, 18, 84, the middle part of the latter holding cupping glass 86 and still on the posterior part the parallel bases 14 and 16 the remote control reception circuit boxes are projected – commands 88.

As we can see in Figures 1 and 2 a sphere is provided for line signals purposes, generally indicated by numeric reference 100, comprising two semi-spheres 102, 104, fitted on their side terminals with plastic projections 108 that, when connected, make a unit for the fitting on the lightning rod cable 110, a vertical shaft 112 fitted with an eyelet 114 on its upper end, connected on its lower part to a support 118 of the semi-sphere 104, the aforesaid vertical shaft connected to a walrus-type connector 120.

Still according to the Second concretization of the present invention, a method for the installation of signal spheres in energized transmission lines is provided. The method includes the following stages:

- Fitting of signalization sphere 100 through the side span 116 existing between the two semi-spheres 102, 104 on the lightning rod cable 110, until the lightning rod cable is inside and not fastened to the walrus-type connector 120, so that the signalization sphere will be

ready to be moved without the risk of falling along the lightning rod cable 110.

- Fitting of the device 10 upstream against the aforesaid perfected signalization sphere 100, laying the device on the lightning rod cable that will be in contact with activating engines 26 and 28 of the aforesaid installation device 10, fitting the wheel 42 in the slot 38 through the shaft notch 40, so that the device 10 grounding can be made, once the wheel is made of metallic conductive material and all the other components of the device are insulated.
- Fitting of the fork 52 on the external part of the bases 14, 16 by means of a pivot 46, and the feeding system 54;
- Coupling of the coupling prism end 56 to horizontal shaft 112 of the sphere 100 at the end of eyelet 114 of device 10.
- Activation of the device 10 by a remote control transmitter by means of the forward/backward engines 26, 28, leading it to the appropriate location for the installation of the sphere 100;
- Wrench-wise rotation, by means of remote control, at the objective location of the installation, of the tightening and loosening tool 74, which tightening will operate in the eyelet 114 of the vertical shaft end 112, providing the closing of the walrus-type connector 120 on the lightening rod cable 110.

As we can see in Figures 1 and 2, a cupping-glass 86 is provided and coupled to shaft 84 that is located on the front part of device 10 that will stick to the external surface of the signal sphere by contact suction, as well as a video camera 106 in order to sweep the lightening rod cable 110 for maintenance purposes.

If the checking of the conditions of the lightening rod cable 110 becomes necessary, in the same way it had been assembled before, the device 10 will be used to travel all the length of interest of the lightening

rod cable 110, once it has a video camera 106 coupled to the rod 90, the aforesaid video camera 106 will monitor the signal sphere 100 installation operations and traveling that length will provide all necessary information of the cable real condition for a possible maintenance.

It is important to notice that the make of the remote control used for this invention is a Futaba model FP-T4NTBF, although this invention is not restricted to this one only. Moreover, the tension of battery 54 (12 volts) is transferred to the activating engines 26 and 28 and to the tightening and loosening tool 74 by means of a parallel cord to the control boxes 88 and, although the invention is not restricted to this one, the control boxes are formed by a Fatuba FPR 127-DF receptor, with two S 3003 servomechanisms and a feeding unit that after receiving the commands activate the two forward/backward engines 26 and 28 and the tightening and loosening tool 74 that shows a torque device manned by the user.

As it has been mentioned before, this method uses signalization spheres 100, adequate for helicopters that have an eyelet 114 at the end of the vertical shaft 112 and, when it moves, it displaces the walrus-type connector 120, as it can be seen in Figure 2. If the movement of the tightening and loosening tool 74 is towards the tightening, the walrus-type connector 120 will be displaced at the closing of the lateral span 116 existing between the two semi-spheres 102 and 104, that form the afore mentioned signal sphere 100 and therefore, the wrenching of the walrus-type connector 120 on lightening rod cable 110.

Also worth highlighting is, in the assembly of the metallic conductive wheel 42 on slot 38 in order to provide the earthing of the device 10, idler tension control is provided as well; noting, also, that, in order to surpass sharp-edged acclivities and declivities, it is necessary, in such case, to operate on the crank 48, which, through the vertical axis 44,

supported bent over fixed axis 22, suspends the entire mobile array compounded by mobile rods 32 and 34 in the mobile axis 36 fixed in its upper part by tightening the wheel 48 over lightning-rod cable 110, where spring 50 of such array operates as a dampener.

Finally, concretizations above described of the invention are intended to be illustrative only. Numerous alternative concretizations can be described by those technical experts on such matter without escaping the scope of the claims below.